Marshallese

401185

Box 6, Part 1
2.8 #4
9/1978 - 5/1979

Department of Energy
Pacific Area Support Office
P O Box 29939
Honolulu, Hawaii 96820

DEC 19 1978

Dr. Hugh Pratt
Brookhaven National Laboratory
Associated Universities, Inc.
Medical Department
Upton, L.I., N.Y. 11973

Dear Hugh:

YOUR LETTER OF DECEMBER 1, 1978

Having the benefit of your thoughts on the feasibility of carrying a helicopter aboard Liktanur II was much appreciated. I concur with your recommendations and have already acted upon them. Should future DOE program needs dictate the need for a helicopter we will again review the matter. However, for now it is in abeyance.

As to the long range medical program, we are keenly interested to know its ultimate scope and direction. You, I'm sure, will be interested to know that DOE plans to keep the Mid-Pacific Marine Laboratory on Enewetak operating on a full time, stand alone, basis after the Cleanup and Rehabilitation work is finished (April 1980). Present planning is that the runway will remain. Given these factors we envision a good basic arrangement for both the medical and environmental work that surely must continue at that atoll for many years to come. As you said in your letter, a huge factor in our mutual planning for the future will be final decisions on Bikini and Enewetak resettlements. Logistical support requirements may reasonably be assumed to be a by-product of those decisions.

I'd like to turn now to the DOE Research Vessel Liktanur II and its use in support of our Pacific programs. Particularly I want to touch on the relationships between DOE organizations and U. S. Oceanography, another subject which obviously causes you some concern. PASO will assign a senior staff member (Harry Brown) to embark on the January voyage of Liktanur II as DOE Representative. We will make every effort to insure that this first voyage with U. S. Oceanography is successful and to that end, Harry will assume administrative responsibility for the voyage. The BNL Party Chief will of course have complete control of the medical program. The DOE representative will interface with U. S. Oceanography to insure that all necessary support is provided in support of the medical program. Depending on many factors involved in this mission, DOE may designate a representative to be aboard future voyages. Mr. Brown's assignment to this initial trip on Liktanur II has been coordinated and concurred in by Mr. Gates, and Mr. Ray in Nevada, and through Mr. Ray with Dr. Weyzen.

Mutual responsibilities and authorities will be clearly defined within the general framework outlined above and in consonance with our sub-contract with U. S. Oceanography. The details will be discussed with you and Mr. Otterman both here in Honolulu prior to your trip to Majuro, and on Kwajalein. In spite of some of the problems that have arisen during a difficult and hectic pre-contract period, I am optimistic that Otterman will work with us and be an asset to DOE efforts in the Marshalls. It is my job to develop the necessary structure and guidelines to see that that occurs.

I very much look forward to discussions with you and Mr. Otterman as your schedule permits when you get to Honolulu. All of us share your interest, enthusiasm and initiatives in the continuation and success of BNL's work for the DOE in the Marshalls.

Best regards, and a
Happy Holiday to you all,

W. J. Stanley
Director

OP-1001
HUB:idh

cc: M. E. Gates, Manager/NV
Roger Ray, APO/NV
R. W. Taft, AM/PE&B/NV
Dr. W. H. Weyzen, DOE/HQ
Joe Deal, DOE/HQ

TABLE 1

THYROID TUMOR RISK VS DOSE

(Cases/10^6/rad/yr)

GROUP	Yrs. of Follow-up	Children (Age < 10 at exposure) Thyroid Dose Average	BENIGN*	CANCER	Adults (Age > 10 at exposure) Thyroid Dose Average	BENIGN*	CANCER
Rongelap	22	1010	33	2.4	379	16	6.4
Allingnae	22	382	40		135	142	
Utirik	22	83		9.5	30	8	26.4
All	22	317	29	3.5	139	14	10.5
Rochester[16]	17	335	64	5.5			
Ann Arbor[16]	17	20	24	2.2			
UNSCEAR[17]	17	100 - 300		0.5 - 1.5			
ABCC[18]	20	20 - 1000		1.3 (all ages)			

*Corrected for control incidence.

Reference BNL-21924 - Summary of Thyroid Findings in Marshallese 22 Years After Exposure to Radioactive Fallout - Robert A. Conard

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3. Use of film badge data at Rongerik to quantify the fallout building curve-upslope and downslope, and to extrapolate this information to Rongelap and Utirik.

4. Determine the β/γ ratio and thus evaluate the contribution of β dose in estimating the γ depth dose; for example, the β activity dose due to Neptunium-239.

5. Plot all the available data on external radiation and determine decay factors. The question to be raised will be: Do the data result in a curve similar to the estimates $T^{-1.5}$ relationship, or does it exhibit different values, such as $T^{-0.83}$, $T^{-1.2}$ due to weathering or other factors?

6. Examine the question on internal dose estimations from, urine analysis, food ingestion, inhalation and data from animal studies. In this process all available information on diet and lifestyle would be compiled so as to derive realistic dose estimates from external and internal sources.

7. Examine other studies done elsewhere on the thyroid nodules, for example; the Chicago Group Study, and also the use of ^{129}I to determine the early thyroid doses. Historic samples collected soon after fallout will be used in determining the ^{129}I concentrations. In addition, ^{99}Tc would also be determined since it is known to be retained in the thyroid gland. If possible, excised thyroid glands would also be studied for ^{129}I concentrations.

8. Use a "state-of-the-art" computer simulation program to determine the transport and deposition of radioactive fallout following the BRAVO test. This study should give:

   a. plots of integrated air concentration isopleths for fission products iodine, cesium and strontium
   b. deposition isopleths for the aforementioned fission products, plus $^{239}Np/^{239}Pu$ if possible, and
   c. time plots of the buildup and decline of airborne fallout concentrations near sea level at the points of interest, and/or the building of ground deposited fallout.

Status of Study:

1. External Radiation Measurement

   a. Figure 1 shows a plot of the gamma dose rate in roentgens per hour at three feet above ground at 24 hours after the BRAVO test explosion. Figure 2 shows the estimated total dose contours in roentgens at 96 hours after the BRAVO test explosion indicating 175 rads of whole body gamma radiation for the Rongelap inhabitants and 14 rads for the Utirik inhabitants. In view of these observations, an exhaustive search of all reports generated Tables 2 and 3 for Rongelap and Utirik respectively. This data has been plotted in Figures 3 and 4. These plots will be further examined when results from Item 8 above will be received.

APPROXIMATE GAMMA DOSE RATES AT THREE FEET
ABOVE THE GROUND ON D + 1 (One Day after Detonation)
(Roentgens Per Hour)

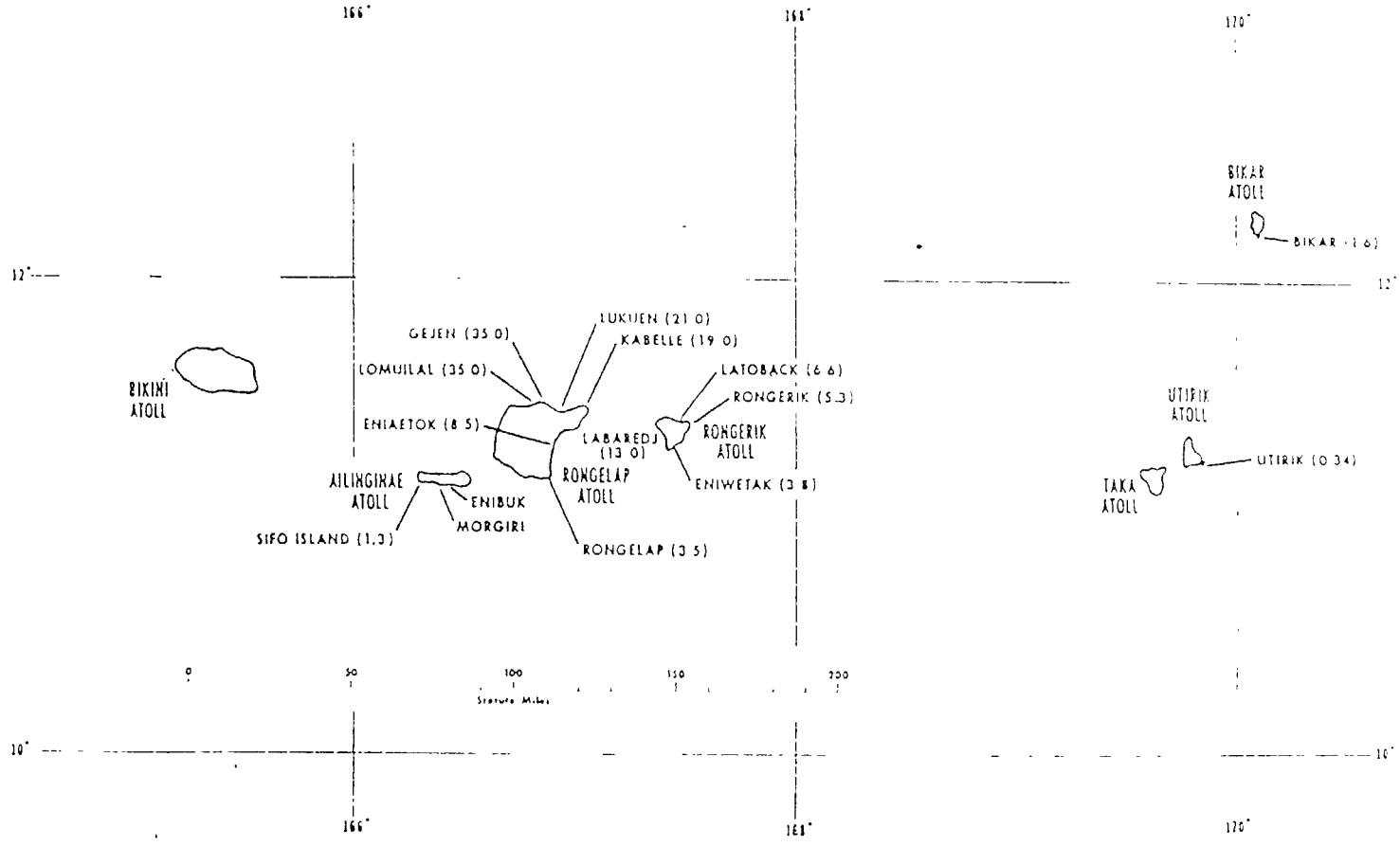

Figure 1

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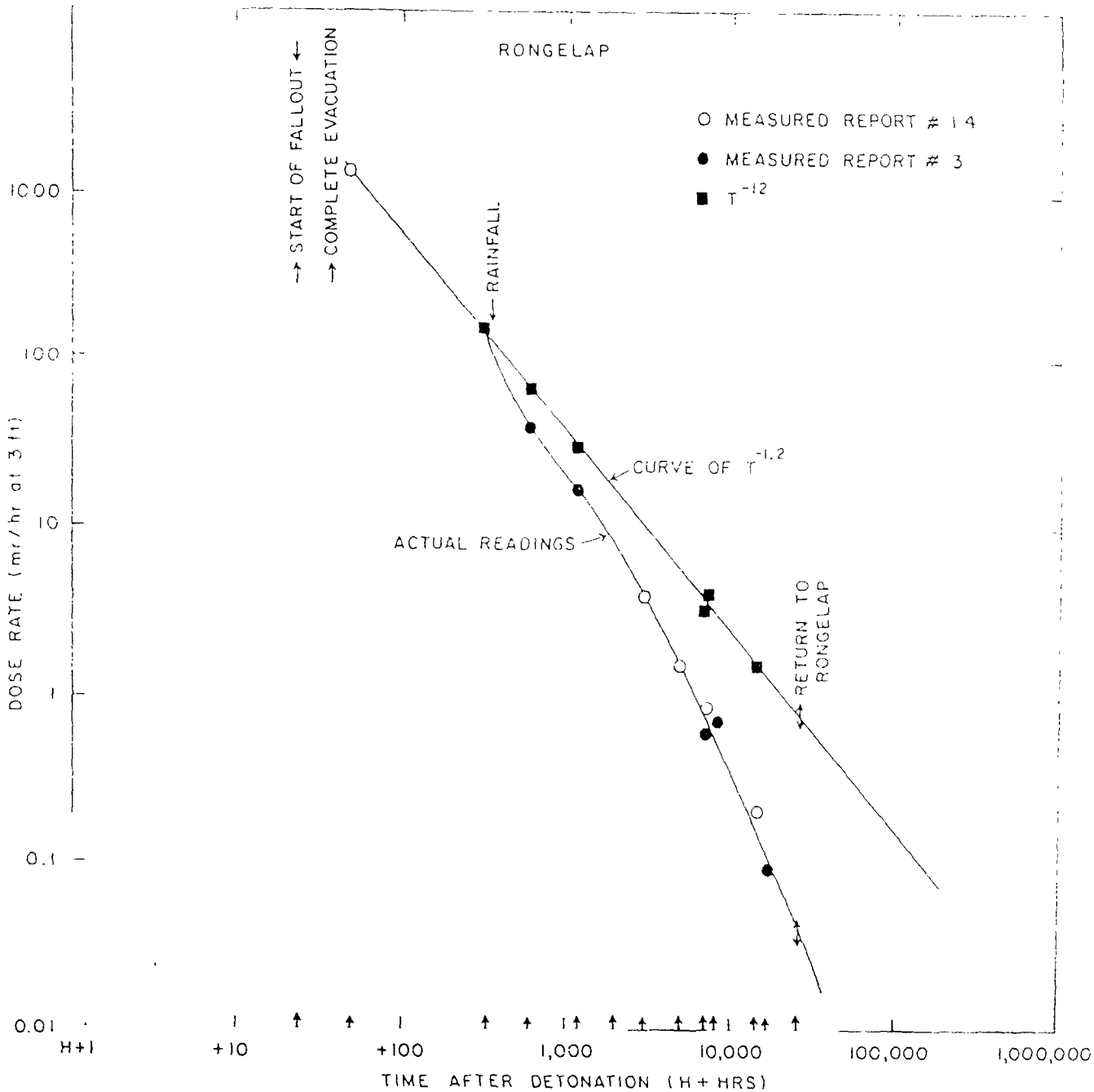

Figure 3 - Rongelap

Table 3

Dose Rates Consequent To The "Bravo" Shot, March 1, 1954

Utirik - 300 miles from GZ

Date	H + Hours	Dose Rate (mR/hour)	Total Dose (R)	Comments	Referen
3/1/54	H+1				
	H+22				
3/2/54	H+24	340		Fallout begins extrapolated	1,2 4
	H+28	350			
	H+36			End of fallout	1,2
	H+55			Evacuation started	1,2
3/4/54	H+78	110	14	Evacuation completed	1,2
	H+28 To H+78 H+90		9.76	Based on plot of data	5
3/8/54	H+168			Decay curve follows $T^{-1.2}$	1 1
3/9/54	H+192	40			1
3/15/54	H+336			Decay curve follows $T^{-1.3}$	1
	H+2160			Return to Utirik	
7/1/54	H+2880			Return to Utirik	
2/1/55	H+8088	0.14			3
6/1/54	H+2160 To		5		4
6/1/55	H+10928				
2/1/56	H+16848	0.05			3
7/1/54 To 7/1/65	H+2880 To H+100000		3.10	Based on plot of data	5
9/25/76	H+190000	0.004		BNL data Sept 1976	
3/15/54 To α	H+336 To H+α			Decay curve follows $T^{-1.4}$	1
6/1/54 To α	H+2160 To H+α	17			4

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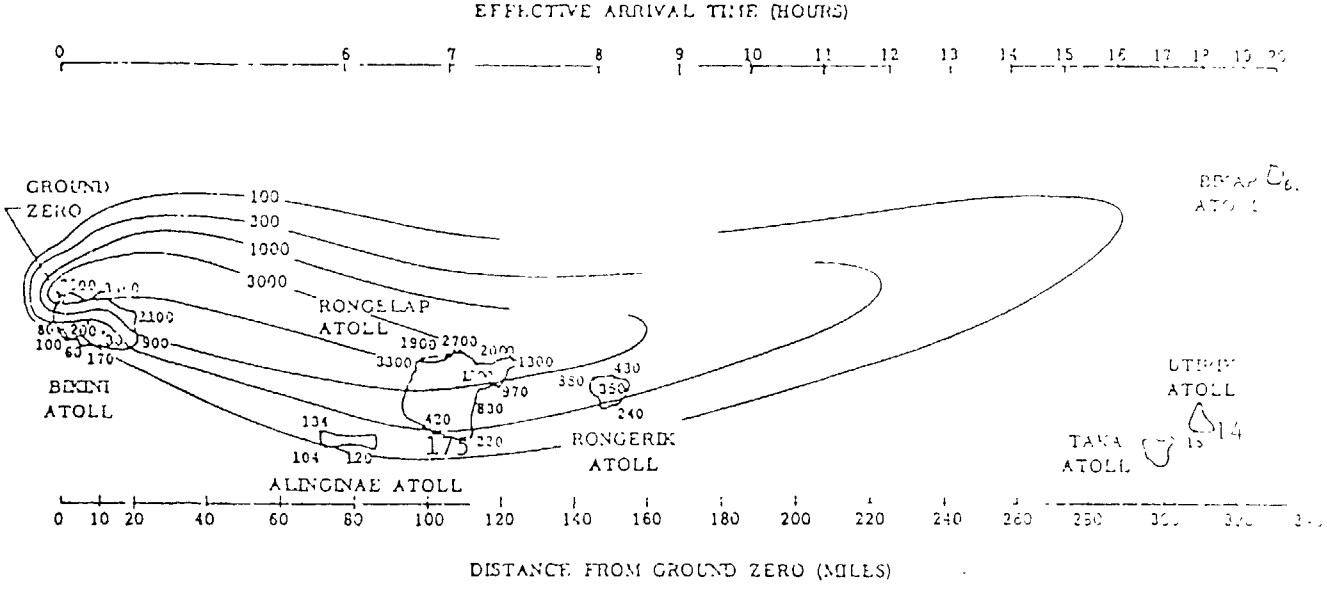

FIGURE 2

ESTIMATED TOTAL-DOSE CONTOURS IN ROENTGENS AT 96 HOURS AFTER THE BRAVO TEST EXPLOSION

Table 2

Dose Rates Consequent To The "Bravo" Shot. March 1, 1954

Rongelap - 115 Miles From GZ

Date	H + Hours	Dose Rate (mR/hour)	Total Dose (Rads)	Comments	Reference
3 1	H + 4 to H + 6			Fallout Began	2
3 2	H − 24	3500			6
		3300		Estimated	1
	H + 46				
3 3	(H + 48) to H + 50	(1300)	175	Evacuated	1
3 11	H + 240	200		From Plot	5
	H + 336	160		Rainfall After This Period	1
3 21 54	H + 480	80	(50)	Reduction in actual measurements when compared to $T^{-1.2}$ curve. The actual readings in brackets ( ), indicating reductions of 20-40%, due to rainfall.	1,2,4
	H + 240 to H + 600				
3 31 54	H + 720	50	(30)		1
	H + 960	38	(20)		1
4 19 54	H + 1200	30	17		1,4
		28			
	H + 1440	25	(14)		1
6 1 54	H + 2400	14	(5)		1
10 1 54	H + 4800	5	(1.5)		1
1 1 55	H + 7200	4	(0.85)		1
		3.2	(0.60)		4
	H + 8088		(0.7)		3
	H + 14400	1.5	(0.2)		4
	H + 16848		(0.09)		3
7 1 56	H + 21864		(~0.1)		1
3 2 57	H + 26288		(~0.1)		1
9 5 59	H + 48180		(0.03)		Univ. of Washington
			(0.04)		

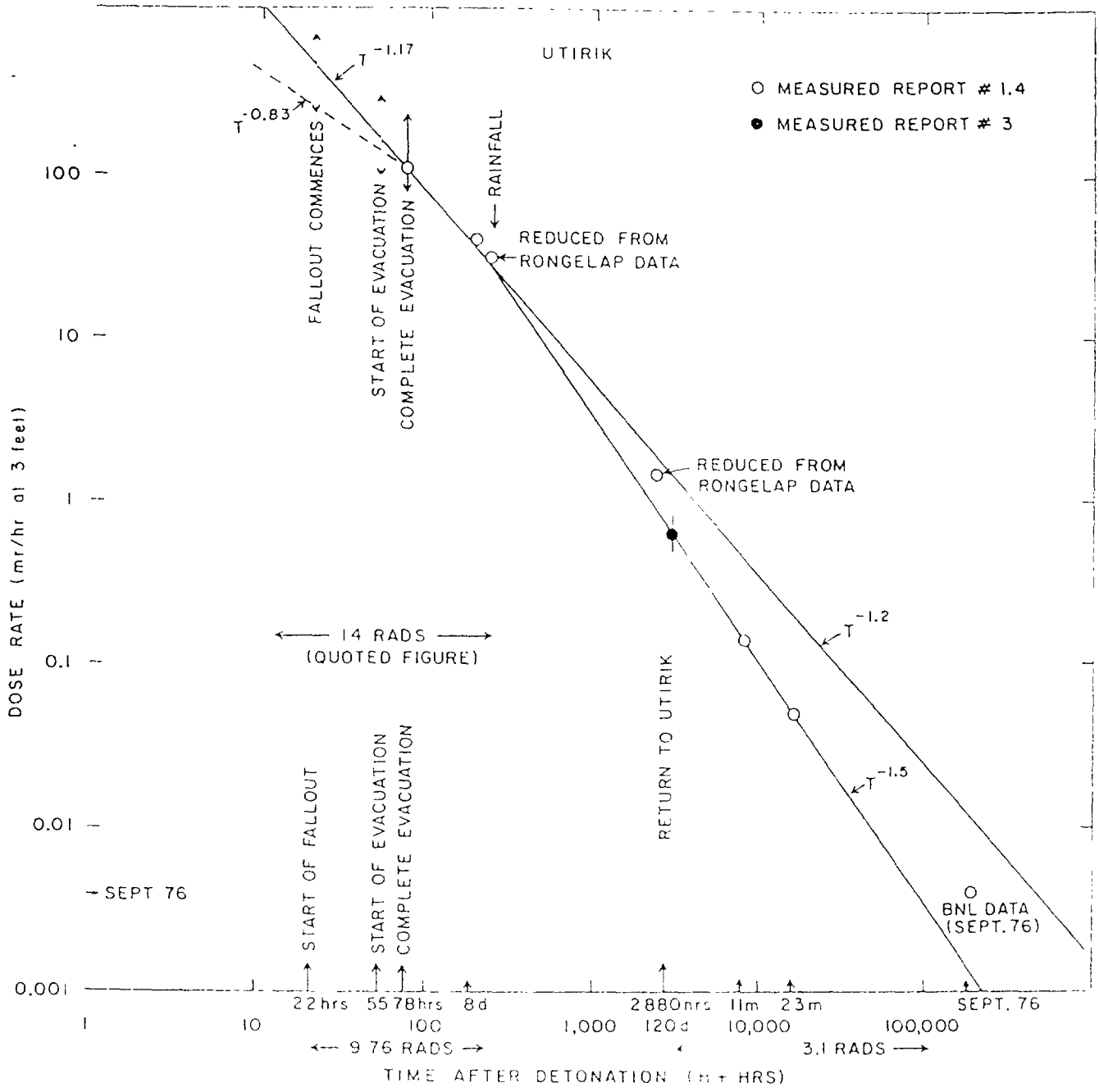

Figure 4 - Utirik

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References:

1. Joint Committee Report: U. S. Congress, 1957, pgs. 173, 174, 192, 198, 222, 224.

2. Glasstone: The Effects of Nuclear Weapons, 1957, pgs. 424, 426. Figures 12.106, 12.107, 12.108, pgs. 432, 433.

3. Report: USAEC, pgs. 206, 207.

4. Dr. Harley's Letter of October 27, 1976 to Dr. Conard.

5. Plot of All Available Data - Figures I & II.

6. Dunning, G. M., April 1958, Vol. 19, #12, pg. 115, Industrial Hygiene Journal.

7. University of Washington Data, September 1959.

2. Diet and Lifestyle Study

   a. All available reports concerning fallout on Ailinginae, Rongelap, Rongerik and Utirik have been examined and pertinent information has been collated into one location. The data collected concerns external radiation measurements, radionuclide concentrations in soil, water, vegetation, animals and food items. In addition, efforts are being made to collect information on whole body analysis and bioassay samples.

   b. A recent diet and lifestyle study completed in November 1978 will provide a firm basis to estimate internal and external doses.

3. ^{129}I Study

   a. Historic samples collected by University of Washington during the period 1954-1974 have been analyzed for ^{129}I (Table 4). These samples are also being analyzed for ^{99}Tc. Information from Item 8 (Methods of Study) will be required to correlate the findings. Additional samples from these areas (Rongelap, Ronerik, Utirik) will be analysed for ^{129}I and ^{99}Tc if required. In addition, we are exploring the possibility of analyzing "Bikini-ash"-the fallout that settled on "The Lucky Dragon". This sample should provide the most accurate description of the fallout.

4. 'State-of-the-Art' Computer Simulation

   a. All available data pertaining to meteorological conditions before, during and after the BRAVO test have been collected and transmitted to Lawrence Livermore Laboratory for the computer analysis. These results should be available by February/March 1979.

   b. A recent Marshall Islands Radiological survey completed in December 1978 should provide iso-dose lines for recent times. Comparison of the two plots should be very valuable in assessing 1954 observations.

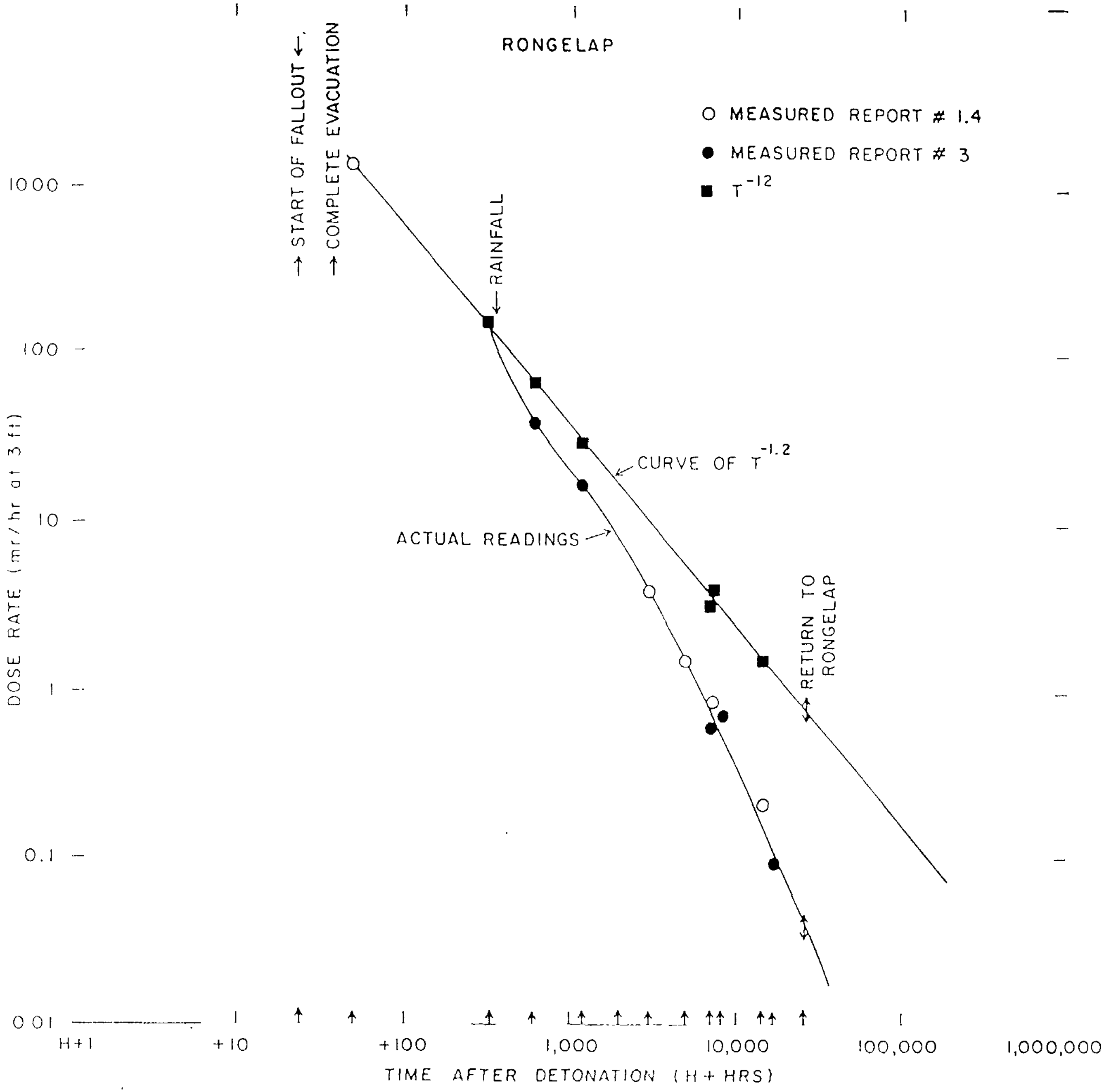
5. Discussions are being continued with the scientists and technical people who were involved during Operation Castle.

Table 4

^{129}I Radiochemical Analysis Results*

DATE	I-129 ATOMS/G	PCT ERROR	I-129 ATOMS/µG	PCT ERROR	COMMENTS
32654	4.44E+10	3.4	2.77E+09	4.5	ISLAND SOIL, (SAND), TOP 1 INCH, RONGELAP-LABARDZ
71654	4.80E+10	3.6	3.88E+09	5.8	ISLAND SOIL, (SAND), ALMOST NO HUMUS), RONGELAP-KABELLE
12955	1.33E+11	4.2	3.65E+09	6.8	ISLAND SOIL, (SAND), RONGELAP-KABELLE
12555	1.53E+11	3.4	7.77E+09	6.9	ISLAND SOIL, (SAND), RONGELAP-RONGELAP
102255	2.24E+11	3.1	1.52E+10	6.5	SOIL, (SAND), SUBSAMPLE SPECIMAN A-12) RONGELAP
102255	1.73E+10	4.2	1.59E+09	5.7	SOIL, (SAND, FROM BOTTOM OF WELL), RONGELAP ATOLL
102255	2.98E+10	3.5	9.72E+08	6.1	SOIL, (SAND, SUBSAMPLE SPECIMAN A-9), RONGELAP
72456	4.73E+10	3.7	2.60E+09	6.4	MID ISLAND SOIL, (SAND 0-2"), RONGELAP-KABELLE
72356	2.02E+10	3.3	1.10E+09	6.3	SOIL, (SAND 0-2", POSS. FALLOUT CONTAM.), RONGELAP-RONGELAP
72356	1.12E+10	3.2	4.58E+08	5.6	SOIL, (SAND 0-2", MID ISLAND CLEARING), RONGELAP-RONGELAP
71857	7.60E+10	3.8	4.17E+09	6.6	ISLAND SOIL (SAND, RANDOM TOP INCH), RONGELAP-KABELLE
71757	2.13E+10	3.5	1.90E+09	4.6	SOIL (SAND, RANDOM TOP INCH, E 1/2 OF ISLAND) RONGELAP
12355	4.14E+09	7.5	1.52E+08	10.9	ISLAND SOIL (SAND) UTIRIK ATOLL
12355	9.31E+08	6.7	4.45E+07	8.3	BLACK BEACH SAND, UTIRIK ATOLL
112874	3.82E+09	3.3	2.22E+08	4.3	SURF, SOIL, 0-2.5 CM, SW TRANSECT, RONGERIK-ENEWETAK ISLAND
112874	6.13E+09	3.4	3.73E+08	5.2	SURF, SOIL, 0-2.5 CM, NE TRANSECT, RONGERIK-ENEWETAK ISLAND

*Done by PNL, Hanford, Washington



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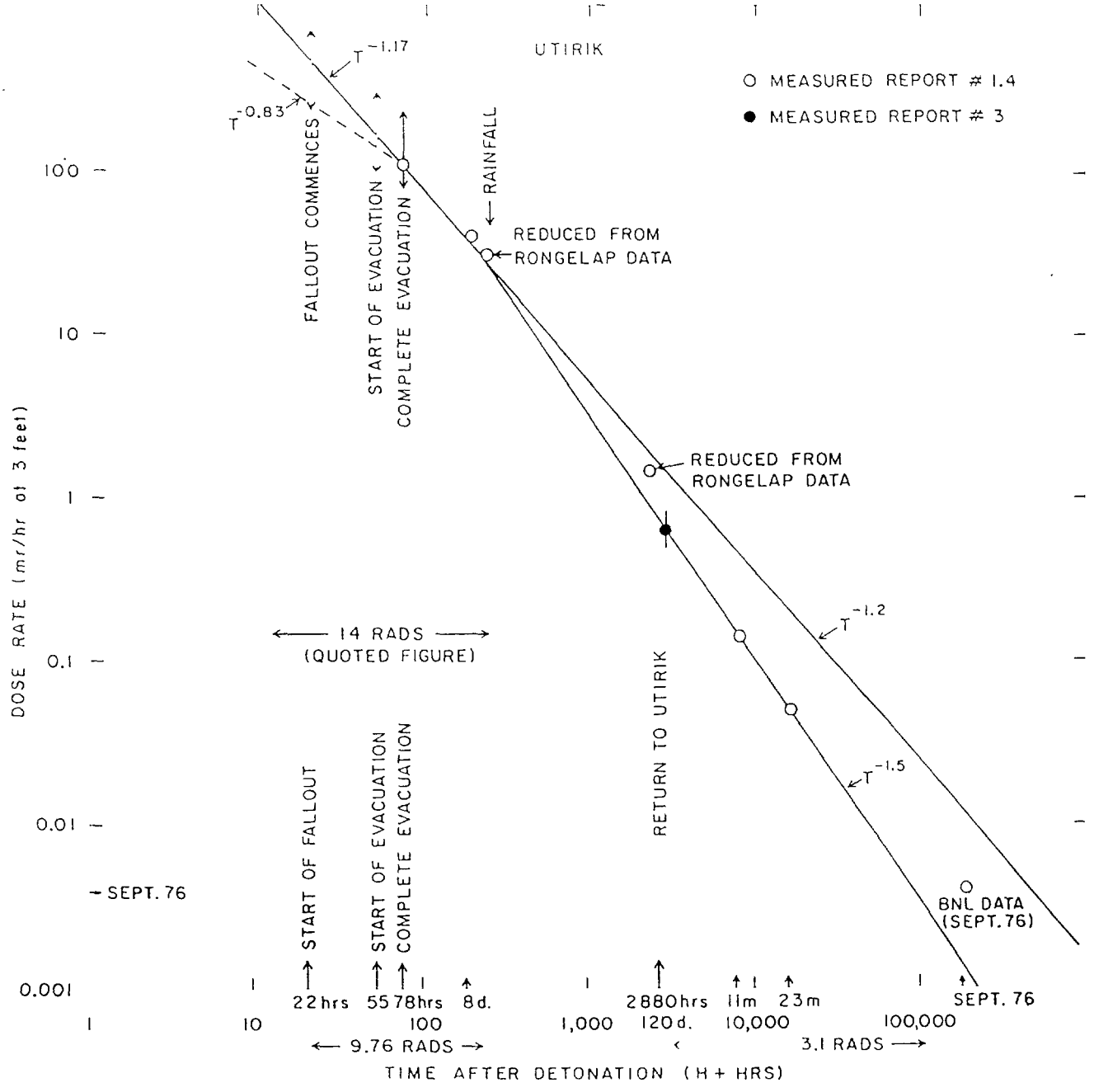
UTIRIK
O MEASURED REPORT # 1.4
● MEASURED REPORT # 3
T -1.17
T -0.83
FALLOUT COMMENCES
START OF EVACUATION
COMPLETE EVACUATION
RAINFALL
REDUCED FROM RONGELAP DATA
REDUCED FROM RONGELAP DATA
T -1.2
T -1.5
14 RADS (QUOTED FIGURE)
RETURN TO UTIRIK
BNL DATA (SEPT. 76)
SEPT. 76
DOSE RATE (mr/hr at 3 feet)
100
10
1
0.1
0.01
0.001
SEPT. 76
START OF FALLOUT
START OF EVACUATION
COMPLETE EVACUATION
22hrs
55 78hrs
8d.
2880hrs
11m
23m
SEPT. 76
1
10
100
1,000
120d.
10,000
100,000
9.76 RADS
3.1 RADS
TIME AFTER DETONATION (H+ HRS)

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